EMI-2010-1

Roll No. .....

Total No. of Pages : 3

BT-4/JX 8314

Electronics Instrumentation and Measurements

Paper : ECE-202E

Time : Three Hours] [Maximum Marks : 100

Note :– Attempt any **FIVE** questions, selecting at least **ONE** question from each Unit.

UNIT–I

1. (a) Distinguish between *static* and *dynamic* characteristics of a measuring system. Define these characteristics and state the relevance of each in a measuring process. 12

   (b) Compute the maximum percentage errors in the sum and difference of two voltage measurements when V_1 = 100 V ± 1% and V_2 = 80 V ± 5%. 8

2. (a) Draw the circuit of a Kelvin bridge, explain its operation, and derive the equation for unknown resistance. 10

   (b) Draw a circuit diagram to show how the insulation resistance of a cable should be measured ? 10

UNIT–II

3. (a) Sketch the circuit diagram of Hay inductance bridge. Derive the equations for the resistive and inductive components of the measured inductor. Discuss various applications of the Maxwell and Hay bridges. 12

(b) A Maxwell inductance bridge uses a standard capacitor of $C_3 = 0.1\,\mu F$ and operate at a supply frequency of 100 Hz. Balance is achieved when $R_1 = 1.26\ k\Omega$, $R_3 = 470\ \Omega$, and $R_4 = 500\ \Omega$. Calculate the inductance and resistance of measured inductor, and determine its Q factor. 8

4. (a) Sketch the circuit of an ac electronic voltmeter using a voltage-to-current converter with full wave rectification. Explain the operation of the circuit. 10

(b) Sketch the oscilloscope display that occurs with sine wave horizontal and vertical inputs that (i) are in phase, (ii) are in antiphase, (iii) have a phase difference of 90°, and (iv) have a phase difference greater than zero but less than 90°. 10

UNIT–III

5. (a) Sketch the block diagram for a swept super-heterodyne spectrum analyzer. Explain the system operation. 12

(b) A 20 V dc voltage is measured by analog and digital multimeters. The analog instrument is on its 25 V range, and its specified accuracy is $\pm 2\%$. The digital-meter has a 3½ digit display and an accuracy of $\pm(0.6+1)$. Determine the measurement accuracy in each case. 8

6. Define dual slope integrator and zero-crossing detector. Sketch the block diagram and system waveforms for a digital voltmeter that uses a dual-slope integrator. Explain how it operates, and discuss the advantages of the dual-slope system. 20

UNIT–IV

7. (a) What are the transducer selection parameters ? Describe the operation of piezoelectric transducer for pressure measurement. 12

(b) For a certain thermistor, $\beta = 3140$ K and the resistance at 27°C is known to be 1050 Ω. The thermistor is used for temperature measurement and the resistance measured is as 2330 Ω. Find the measured temperature. 8

8. (a) Describe the various stages of a FDM system and a TDM system, by means of block diagrams and explain the function of each stage. 10

(b) What are the important characteristics of a telemetry system and distinguish the criteria on which the telemetry and communication systems are based ? 10